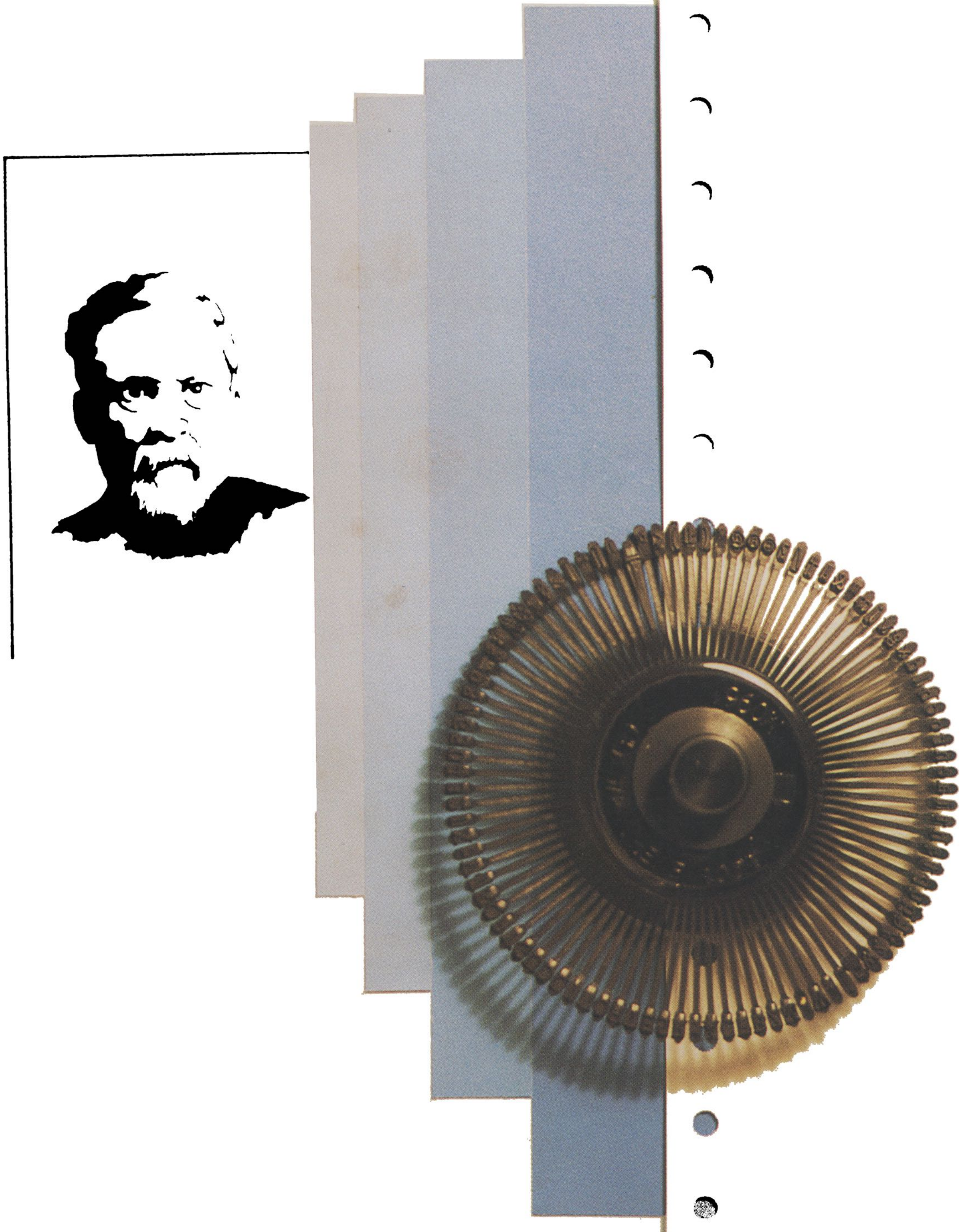
# PRACTICE COMPUTING



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October 1984

Dear Doctor

Practice Computing will be brought to you free of charge under the sponsorship of ICI Australia.

Computers are continually making inroads into various facets of our lives and everyone of us is confronted daily with some aspect of the computer industry - be it computer addressed letters, computerised bills or computer generated pathology reports.

Many doctors are now looking at the possiblity of using computers in the running of their surgeries.

Practice Computing will feature:

1. Reports on what systems are available together with an analysis of their capabilities.
2. Articles from doctors documenting their own experiences with computers.
3. A question and answer section catering for beginners through to experts.

We hope that you enjoy this first issue of Practice Computing.

Yours faithfully

John Varigos

John Varigos
Product Manager

JDV:VI

Incorporated in Victoria

# PRACTICE COMPUTING

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***OUR COVER***

*We look back through the pages of medical history to Louis Pasteur who in 1885 saved the life of a boy, bitten by a rabid dog, by giving him an inoculation against rabies. We are now in the era of the computer with its vast range of applications.*

*In this issue we discuss some of these applications in medical practice including the facility to identify and recall selected patients for vaccinations, early cancer detection and management of chronic illnesses.*

# EDITOR'S PAGE

Dear Reader,

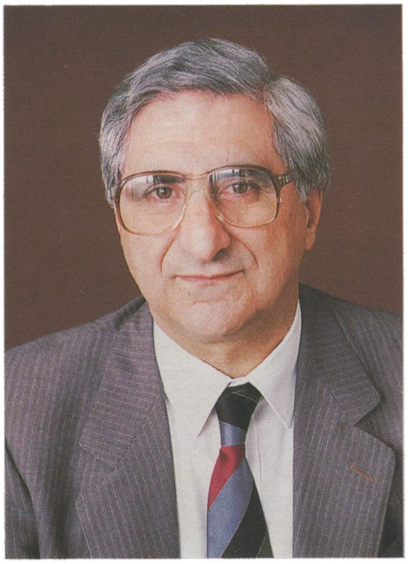
On behalf of my editorial panel, thank you for receiving this new medical journal so warmly and for your encouraging letters and comments. We shall continue the easy-to-read format and develop the theme of presenting something of interest for all types of practices. Don't feel daunted by heavy articles on medical languages and data bases. Understanding how Information Technology systems work is useful and important, but not a prerequisite to using the system. As Dr. DeRuyter quotes in his article in this issue, "you have to learn to walk before you try to run".

Some computer functions are common to the needs of all professional practices (office and administrative procedures, for example). Specific applications have been developed in some specialist fields (for example, the *ONCOCIN* program for determining the optimal treatment of lymphomas and *MYCIN* for selecting appropriate antibiotic therapy). A chart we prepared on the opposite page demonstrates the impressively wide range of applications already in use. It also demonstrates how much is being done to advance patient care unachievable by other means, as in rehabilitation of patients with cerebral palsy.

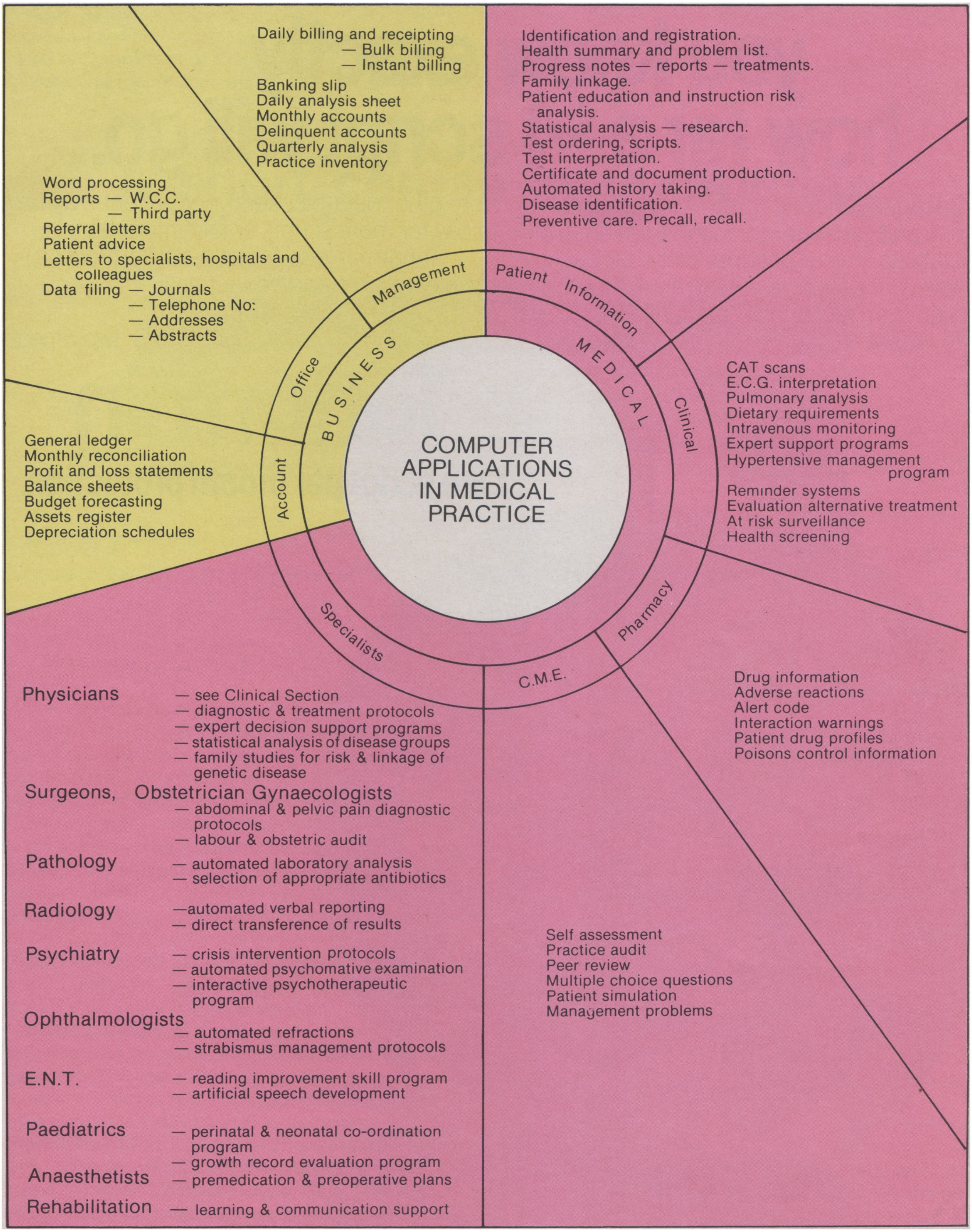
There is a need to improve health care delivery especially between hospitals, other health organisations and the medical practitioner. Also needed is a cost effective means of reaching and involving people in their own health care. The potential for improvement exists and *Practice Computing* will address some aspect of better health care management in each issue.

Finally, a reply-paid card is enclosed for those who have not already indicated they wish their complimentary copies of *Practice Computing* to continue. The card will not be repeated in future issues, so please fill in the particulars and return it now.

I trust you find good reading in the following pages.



a. Assef.



# COMPUTER APPLICATIONS IN MEDICAL PRACTICE

Daily billing and receipting
— Bulk billing
— Instant billing
Banking slip
Daily analysis sheet
Monthly accounts
Delinquent accounts
Quarterly analysis
Practice inventory

Word processing
Reports — W.C.C.
— Third party
Referral letters
Patient advice
Letters to specialists, hospitals and colleagues
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— Telephone No:
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— Abstracts

General ledger
Monthly reconciliation
Profit and loss statements
Balance sheets
Budget forecasting
Assets register
Depreciation schedules

Identification and registration.
Health summary and problem list.
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Family linkage.
Patient education and instruction risk analysis.
Statistical analysis — research.
Test ordering, scripts.
Test interpretation.
Certificate and document production.
Automated history taking.
Disease identification.
Preventive care. Precall, recall.

CAT scans
E.C.G. interpretation
Pulmonary analysis
Dietary requirements
Intravenous monitoring
Expert support programs
Hypertensive management program
Reminder systems
Evaluation alternative treatment
At risk surveillance
Health screening

Drug information
Adverse reactions
Alert code
Interaction warnings
Patient drug profiles
Poisons control information

Self assessment
Practice audit
Peer review
Multiple choice questions
Patient simulation
Management problems

Physicians — see Clinical Section
— diagnostic & treatment protocols
— expert decision support programs
— statistical analysis of disease groups
— family studies for risk & linkage of genetic disease

Surgeons, Obstetrician Gynaecologists
— abdominal & pelvic pain diagnostic protocols
— labour & obstetric audit

Pathology — automated laboratory analysis
— selection of appropriate antibiotics

Radiology —automated verbal reporting
— direct transference of results

Psychiatry — crisis intervention protocols
— automated psychomative examination
— interactive psychotherapeutic program

Ophthalmologists
— automated refractions
— strabismus management protocols

E.N.T. — reading improvement skill program
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**Peter Juliff**
BAppSc, AASA, MACS
Head of Department of Computing,
Victoria College, Melbourne.

# A short course in computing

**When acquiring a computer system, the most important component is the software. It is software which performs the user's task either to his satisfaction or his continual annoyance. In the worst case, it can be to his financial ruin. Avoid the temptation to write your own software and make sure that the software which you acquire does your job as you require it done. Choosing software is not unlike choosing a spouse. The best time for negotiations is *before* the contract is signed and the avoidance of an unfortunate marriage is infinitely more preferable to an acrimonious divorce.**

## LESSON 2
## Software for the non-programmer

### 1. Hardware vs software

The software component of a computer system consists of the programs which enable the hardware to carry out the user's tasks. In terms of relative importance in the running of the user's business, **the software is by far the most important component.**

**When one implements a computer-based system, it is the software which governs the ultimate success or failure of the enterprise.** The software also governs the ease or difficulty of use of the system and is the most important factor in determining the long-term viability of the system. It is the software which provides the "spirit" of the data processing system, the hardware being merely the "clay" necessary to embody it and enable it to achieve tangible results.

**When purchasing a computer system, it is the software which needs evaluation rather than the hardware. The vast majority of computer hardware in today's marketplace is extremely reliable and largely interchangeable with respect to its component units. Provided hardware is purchased from a reliable vendor with adequate service facilities, there is not much scope for error. Unfortunately, a large proportion of commercially available software is neither well written, well documented nor well supported.**

**It is the purpose of this issue to examine the nature and function of computer software.** Traps for the unwary purchaser will be detailed in the fourth of this series.

### 2. The nature of a program

A program consists of a series of instructions held within the memory of a computer and executed by the Control Unit of the Central Processor. As we will see below, a computer will usually hold all or parts of several programs in its memory at any one time. At any instant, however, its processor can only be executing one of those programs.

**The instructions are held magnetically within memory** and each will normally consist of an operation to be performed plus an 'operand' which is the subject of that instruction. The operations able to be performed are usually extremely basic in their nature, e.g. add, subtract, multiply, divide, transfer the contents of one memory location to another, compare two values to determine which is the larger, transfer data between internal memory and an external peripheral device, branch to another part of the program etc.

Indeed, the tedium of calculating invoices with the use of a simple calculator is a good parallel to the level of operations carried out by a computer's program. The price of an item must be multiplied by the quantity purchased and the result must be "remembered" by holding it within the memory of the calculator. That result must now be multiplied by a discount percentage and/or a sales tax factor to obtain the extended price. The sum of all such extended prices must be accumulated for the whole invoice to arrive at the total chargeable to the customer.

**The essential difference between a simple calculator and a computer in performing this task is not the number of individual operations needed to do the job but rather that the clerk using the calculator must repeat every operation for every invoice whereas the computer can store these steps within its memory (along with the data) and can be instructed to go back and repeat them *ad infinitum.* The computer can also store that program of instructions on a magnetic tape or disc so that subsequent invoicing sessions do not require the operator to specify the task once again but merely to load the program into memory from the "library" tape or disc and give the command to start it running.**

Programs in memory are therefore transient. They are loaded from their library storage peripheral, they are run to produce some desired results and they are then overwritten in memory by the next program loaded to perform some different task. A computer will also have some program or programs permanently resident in memory. We have a "chicken-and-egg" dilemma in that a computer can only read a program into memory by the operation of a program already in memory. Hence, **every computer must have at least a 'bootstrap' program in ROM (read-only memory) which is permanently resident and which reads the first operating program into memory from disc or tape.**

## 3. Types of software

**A computer makes use of two major categories of software: system software and application software.**

**System software** comprises programs which enable the computer to perform its housekeeping and administrative tasks rather than make any specific contribution to the user's business. **There are three main items constituting a computer's system software:**

(a) **The operating system.** By far the most important component of any software system, **the operating system co-ordinates all of the activities of the computer.** It loads application programs to run at the user's request, it handles all of the file housekeeping chores for programs storing and retrieving records to and from peripheral devices, it shares the computer's time between several users if more than one application program is allowed to be resident in memory at any time and it is the means by which system security is implemented in the form of users' passwords or restrictions on access to certain files. Simple operating systems allow one user of the computer at a time. More complex versions will multi-program (or time-share) the resources of the computer amongst several concurrent users.

(b) **System utilities.** These may in fact be part of the operating system for many computers. They are a group of housekeeping programs which do chores such as copy files from one medium to another, sort files into a nominated sequence, permit the editing of the contents of files, etc.

(c) **Programming language processors.** Basically any computer may be programmed in any language. The language(s) available to the user or programmer depends on the translating facilities offered for a particular computer. As will be explained below, programs written in a programming language need translating to the computer's own machine code. The translation is done by this component of the system software and hence the variety of languages available depends on the number of "compilers" (translators) available for a particular computer.

**Application software** comprises the programs which perform the user's tasks, e.g. payroll, inventory management, patient accounting, medical history maintenance, banking, airline reservations, etc. This software is run under the managing umbrella of the system software. At any time the internal memory of the computer would contain all or part of the operating system plus all or part of one or more application programs.

## 4. Programming languages

**There is nothing new in the concept of programming languages. Knitting patterns and music scores are programming languages in that they prescribe, in a manner which is concise and unambiguous, a series of operations which are to be done in a certain sequence.**

**Computers store programs as a series of numbers.** Each operation has a numeric code, every memory location has a numeric address, all data is held in memory as either a numeric quantity or a numeric code. In the beginning, programmers wrote in this numeric "machine code" but this was tediously long, extremely error prone and had to be re-learned when moving to another computer as all such code is indigenous to its own model of computer. **From this**

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**first generation of programming languages emerged a second generation referred to as assembler languages.** These enabled programmers to use mnemonic alphabetic operation codes and symbolic alphanumeric names for memory locations. However, they were still very tedious and unique to their own computer. Such programs also needed to be translated back to machine code, via a translating program, before they could be executed.

**A third generation of languages** referred to as "high-level" or "compiler" languages emerged which were, in most cases, able to be used on a variety of computers. Such languages are those commonly recognised today by names such as BASIC, COBOL, FORTRAN, PASCAL, etc. These also need translation to machine code before they can be executed, the translation being done by "compiler" programs for each language. Hence the availability of a particular programming language for any computer depends on the availability of a compiler program for that language able to be run on that computer.

**The program written in its original language,** i.e. BASIC, COBOL, etc., **is known as the "source program"** and in its translated, machine code, version is known as the "object program". Both versions of the program are held on the library disc or tape. The object version is the one which is loaded into memory and executed when the user's job is to be run. **The source version is that which a maintenance programmer must have access to in order to make any alterations required to effect any changes in the way in which the user requires his task to be carried out from time to time.**

**Most languages have the translation from source to object format done in order to be able to run the program in the machine code which the computer understands. A notable exception to this process is BASIC. Usually BASIC programs are stored only in their source format and they are converted repeatedly to machine code as they run the user's job. This is referred to as "interpretation" rather than compiling. It saves disc or tape storage space but results in a slower, less efficient program than one which has been fully compiled.**

## 5. Sources of software

**In the early days of computer-based systems, it was accepted that the user's staff wrote their own application software.** As it became obvious that much software of a similar nature was being developed by a number of parallel projects, emphasis shifted to the acquisition of pre-written software, or "packages". This shift has been reinforced by the proliferation of less expensive computer systems used within organisations which could not support the expense of a resident team of programmers. Hence, **the average small-to-medium scale user today will typically purchase his major items of software either as a composite system with the hardware or from an independent software vendor.**

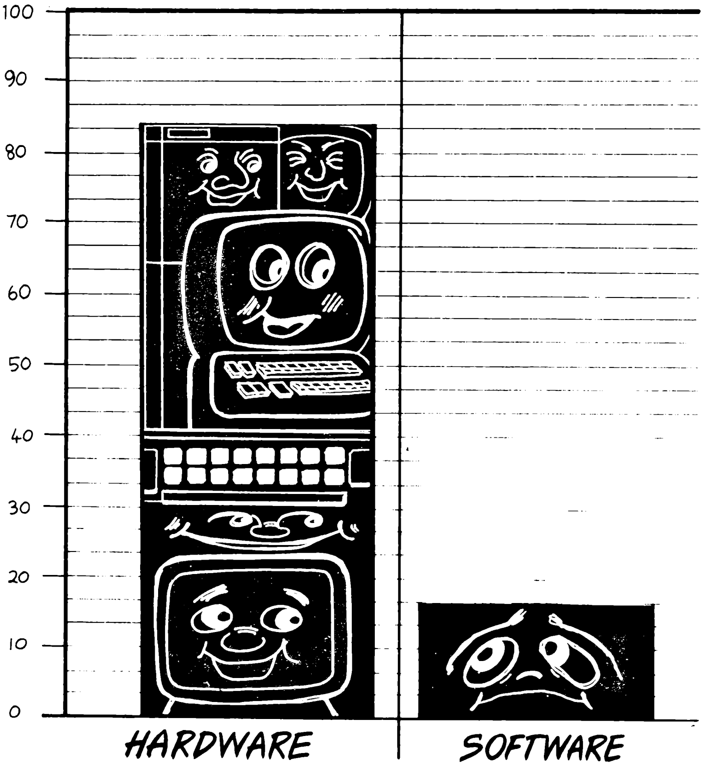
**Packaged sofware has the obvious advantages of freeing the user from the resources needed to develop software in-house and provides an opportunity to try-before-you-buy.** However, it must be remembered that many such products were not developed as packages to be tailored for an individual user's requirements. Many started life for use by a specific user and have later been promoted in the marketplace as available to the world at large. The problem with such software is that it has proved notoriously difficult to amend to suit a somewhat different operating environment from that for which it was created.

**System software will almost always be provided by the vendor of the hardware.** This software is oriented towards the idiosyncracies of the hardware rather than the user's working environment and is therefore better developed by programmers with an intimate knowledge of that hardware.

## 6. Fourth generation languages

**In the past few years there has emerged a class of software product known as the fourth generation language (4GL).** 4GLs have been promoted as software tools by which a user may develop his own system rather than having to rely on the professional expertise of programmers and analysts. These products are rather difficult to define accurately and range over a class of software which may generate programs from a user's directions, enable a user to generate *ad hoc* reports and enquiries without having specific programs written for the purpose or enable a user to generate his own 'data base'.

They are often held out as the means by which a user will himself be able to develop data processing systems to his own requirements. One should be wary of placing too much reliance on these claims as the 4GLs rarely provide any help at all in the complex area of system and file design. The time spent in actually programming a commercial system is usually less than twenty per cent of the total development time and a tool which addresses this problem, even if it addresses it well, will not make a significant impact on the overall time and effort involved in the implementation of an application system.



**In Australia we are well served by the supply of computer hardware. It is in the software sector that we expect to see considerable progress.**

## 7. Do-it-yourself software?

**The best advice to give a non-programmer contemplating writing his own software would be much the same as that given to a layman contemplating the removal of his own appendix. It is a dangerous way to save money.**

Writing serious, professional-level software is a job for professionals rather than enthusiastic amateurs. It is not a trivial task to define the requirements of a system, break that system down into several one-job-at-a-time programs, design the structure and logic of each program, define every item of data to be manipulated by each program, become expert in the syntax and semantics of a chosen programming language and devise test data to ensure that each program is working to its specifications.

We can all write small programs for interest and amusement, just as we can all cure ourselves of minor aches and pains. There is a chasm, however, between that level of operation and the tackling of a serious project. In the case of commercial software, it is your business which is at stake.

## 8. The software development cycle

The development of a computer-based system consists of several stages which are performed iteratively until a successful result is achieved. **The first stage comprises the definition of the user's requirements of the system.** This involves specifying the required output from which it is possible to then determine the data which must be retained within the system and this in turn determines the input required.

**The second stage translates this logical model of the system to a physical model which is capable of implementation on the computer.** This encompasses the design of screens and printed reports, the design of the files and the breaking up of the system into a number of discrete operations each of which will be the task of a separate program.

**The third stage consists of designing, writing, testing and documenting the programs.** In terms of the time taken to develop a system from the gleam in the user's eye to the delivered, operating product, this stage usually occupies only around 15-20% of the total. This tends to be much less than most people imagine, but the majority of time is taken up in the definition of requirements and the design of the physical structure of the system.

**The final stage is the cutover from what is usually a manual system to the computer system.** An often under-emphasised task which is a pre-requisite for this stage is the conversion of the data from the current manual files to the computer-held files. This tends to be routine and unglamorous but is extremely time-consuming and often error-prone. It should proceed in parallel with the third stage, program development, so as to form the basis for test data on which the system can be exercised during implementation and in order to be available for the cutover. It is usually advisable to implement the system cutover on a phased basis in order to be able to fall back on the previous mode of operation should the new system prove to have difficulties.

**In the interests of expediency, short cuts are often taken to eliminate or shorten some of these stages. This will invariably lead to a disaster.** While some tasks may be shortened in duration by the use of more staff or productivity tools, others will take their own time by the nature of the task itself. One cannot produce a baby in one month by getting nine women pregnant simultaneously. In particular, any attempt to save time be performing a hasty and incomplete definition of the user's requirements will result in a system which will be a constant source of irritation to those involved in its operation.

## 9. The future

With the increase in cost-effectiveness of our computing dollar we should be able to look forward to the availability of application software more easily able to be tailored to the requirements of a particular user. In the hands of a programmer, a 4GL product can be used to develop a prototype of a required system from which, after acceptance by the prospective user, a working version of the system can be constructed in the knowledge that the finished product is what the user wants.

**With the emergence of fifth generation languages which are logic-based rather than procedure-based as have been traditional languages, we will see a proliferation of expert, or knowledge-based, systems.** These systems, many of which already exist in the medical field, encapsulate a base of knowledge on a particular subject area together with a set of rules specifying the means by which conclusions may be inferred from data provided to the system. **Such systems already perform clinical diagnoses and analyses of chemical compositions as well as more publicised but less important tasks such as playing chess.**

The development of this class of system is currently the subject of an enormous quantity of research and development in Japan and Europe and, to a lesser extent, the USA. ☐

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## HAVE YOUR SAY...

**E. A. A. de Ruyter**
Med Drs (Amsterdam)

**A Sydney general practitioner accepted as an Associate of the Australian Computer Society in March, 1983 questions the advantages customarily extolled for computers, discusses their value in "quality of life" decisions, and says they don't have to be expensive.**

# PCs for GPs

**Microcomputers still do not possess "common sense" or what you would call "discretion" and "reasoning ability". But compared with human beings, a system costing as little as $1,500 has incredible data retrieval, sorting, and calculation speed. Computers should be used for the functions they do exceptionally well.**

We should not forget the warning three years ago of Peter Juliff, Head of the Department of Computing at Victoria College, Melbourne: "The medical profession is currently where the general business community stood vis-a-vis computers approximately 15 years ago. Many businesses acquired computers for status and employed them in pedestrian applications. It was a costly, and in some cases fatal, exercise. The medical profession should profit from the lesson."

**Computers are applied in general practice to do receipts and instant billing, identification and registration of patients, appointment scheduling, test ordering, computer history-taking, prescriptions, statistical analysis, and research.**

**Let us consider whether computers should be used for instant billing.** All that the patient requires when paying after a consultation is a receipt showing the relevant MBS item number and a brief description of the service. It takes about 45 seconds to write that. A duplicate receipt book with 100 receipts costs $1.12 — or 0.0112 cents a receipt. It takes about three minutes to stamp the whole book with the name and provider number stamp which the Government supplies free of charge. This time costs nothing since a secretary can find a spare three minutes once or twice a week to do it. It takes the secretary no more time to write the receipt by hand than it takes to do it by computer. Is it really cost-effective to use a computer costing several thousand dollars to instant bill and print receipts?

**Do you really need a computer to identify and register patients?** You can obtain the existing records of a patient from a filing cabinet in less than 30 seconds. I installed a Rotascan filing system and have got this down to less than 15 seconds. To register a new patient involves typing (or even writing) their name, address, phone number, birth date, pension number, and Medicare number. Using a computer, all this must still be typed. Even if the computer can do this just as well and even just as fast, the question remains: can the computer do it significantly faster or better. If not, why use a computer system which costs thousands of dollars to do something which requires only paper and a ball point pen or a simple typewriter?

**Again, appointment scheduling can be done by computer. But I seriously doubt that it is simpler or faster than using a "week-a-page" appointments diary, which is much cheaper and just as efficient.** For the GP whose practice is attached to his home, the diary can be left beside whichever phone in the practice, lounge room or elsewhere is manned. The computer appointment scheduling apparatus usually remains in the receptionist's office.

It is also hard to see how computer use would be cost-effective for ordering tests. Most doctors are even unable to type (a necessary skill if ordering tests). To have to pass on information to the receptionist about the tests to be ordered simply introduces another opportunity for mistakes and misunderstandings.It takes only one minute to jot some clinical notes and abbreviated tests. The pathologist's staff still has to collect the specimen, so they might as well collect the test order form. Moreover, at present the law requires that the doctor issue a test request in his own handwriting, thus ruling out computers for this.

**Computer transmission of test results would be an advantage.** Results would get to the practice much faster than by mail or courier and much more accurately than if read over the phone and noted by the receptionist.

Dr. Geoffrey Edelsten and Dr. Tom Wenkart were the first in Australia — and perhaps the world — to provide a computerised pathology results service to general practitioners along these lines. Their service was called Preventicare. At the time, many people thought the idea was crazy. But more than a decade later their ideas are being recognised somewhat. Of course, it remains debatable whether the idea was cost-effective in the first place.

Drs. Edelsten and Wenkart first made available computer history-taking to general practitioners on IBM computers with terminals in doctors' surgeries. It was available in English or any one of five foreign languages (if I remember correctly). The finished history could be printed in any of the six languages. it **seems that computer history taking today could be done on a microcomputer.**

**What would be the advantage of computer-written prescriptions?** Certainly they are unlikely to be cheaper. They would also be easier to forge — only a signature instead of a whole handwritten prescription.

**A computer to print monthly accounts and correspondence could,** with careful cost analysis, **be justified by the time saved.** But in this case **the computer makes life easier for the secretary,** not the doctor.

True, **the computer suddenly brings statistical data collection and analysis within the scope of the general practitioner.** This may be useful for those few doctors interested in research. **But research activity can hardly be called the primary objective of general practice. Nor can general practice research be called cost-effective.**

At the Fourth RACGP Computer Conference in May last year (1984), several voices at last deplored that so much energy had been spent on computer accounting and billing. Surely in general practice **computer power should be used for more accurate medical diagnosis, more rational medical decision-making, more appropriate drug selection, and for medical calculations previously thought to be too time-consuming. In short, to make medical care more effective and humane.**

A Nash Logoscope for differential diagnosis could be developed for even a microcomputer system. It would be much faster and more comprehensive than the logoscope differential diagnosis-by-slide rule method.

A simple spirogram analysis program was written in April, 1975 and has been in use in general practice since. After data entry, the calculation program does in 45 seconds what would take about 10 minutes with a hand calculator. It can calculate adjustments for room temperature and barometric pressure which otherwise could, for example, cause a plus or minus 15% variation in final values for the patient's vital capacity and similar variations for the forced vital capacity and $FEV_1$ (The program calculates expected normal values for the patient's sex, age, and height and compares these with the patient's). This program was originally written for an 8K microcomputer.

ECG diagnosis of coronary infarct depends mainly on pattern recognition. It is difficult (if not impossible) to program this into a smaller computer. In the past six years I have found the trans-thoracic ECG of Professor K. Posel (Durban, South Africa) so much simpler and more sensitive that no computer is needed. A simple ECG analysis program calculating in one second the various ECG intervals expressed in fractions of a second, as well as calculation of the electrical heart axis and another vector, has now been in use for several years. This program was developed on a 32K microcomputer.

A microcomputer could be used successfully in medical decision-making or in analysing the risks of various medical and surgical options. Business and administration decisions nowadays are based on risk calculations, cost-benefit analyses, and linear programming to estimate financial losses and gains. it seems we should now be adapting these techniques to medical decision-making where the patient's survival or long term state of health may be at issue.

Where survival is at stake it should be possible with linear programming to indicate the course of action likely to provide the longest life expectancy. These decisions in the past have been made on experienced intuition or sometimes rather blind adherence to standard textbook routines instead of a weighing of the pros and cons in each case according to the often quite unique variables of the medical and even social condition of the individual patient.

It would seem that a print-out showing in black and white the probabilities for survival time and quality of life (perhaps expressed as a pointscore for different treatment options) could often result in different treatment decisions. In the not too distant future, political decision-makers conversant with computer analysis may require doctors to demonstrate that they have carried out a proper analysis of options (for which even a microcomputer would be invaluable) before advising on a particular treatment.

For two years I have been using a simple decision-making program found in an overseas microcomputer journal. It is not used every day. **But when an agonising decision has to be made,** I find the program is most helpful and reassuring both to me and to the patient (whom I always invite to contribute to the non-medical, personal, and social factor scores used). Sometimes the program print-out favours my intuitive choice; sometimes it favours the patient's. Whatever the outcome, we feel we have looked at the problem most dispassionately and exhaustively.

The final pointscore for the various options shows the extent of the differences. Decisions about options and factors and scoring can be done in 45 minutes (a prolonged consultation). It takes only a minute to enter the data into the computer and obtain a print-out. The cost of one prolonged consultation seems well worthwhile in view of the thousands of dollars, great pain and suffering, and effect on quality of life which the various treatment options represent to the individual patient.

It should be emphasised that the computer does not make the final decision. The print-out gives (in descending numerical order) the total scores of each option according to the factors influencing the decision and the preferential weightings given by doctor and patient. Run the program several times (entering different factors and/or weightings) and you will see how they affect the final scores. If one option keeps scoring the highest points after a number of runs, it would seem sensible to select it. The doctor or patient can overrule the computer, but it must be realised that it is an overruling of calculations based on their own data input.

The human brain is not very good at picking the best alternatives from many options affected by a variety of factors with a diversity of weighting. But even a microcomputer can do the calculations in a trice and present clearly tabulated results.

My program for computer assisted medical decisions uses a 32K Commodore microcomputer. A differential drug selection program using a database of 1,000 "most useful" symptoms and 352 drugs has been in daily clinical use since 1975. Using a 256K Commodore-720 microcomputer with a 2-megabyte Commodore 8250 dual disc drive, it gives analysis results for 60 entered symptoms in about 45 seconds. This Commodore equipment costs only $4,300. If a $1,000 printer is added, the system can be used for medical billing and accounting, and word processing and database management. Programs for these functions have been available for some time.

**A database program is excellent for practice stock control and ordering, and for maintaining a medical literature index.** An excellent, inexpensive database program exists for the microcomputer system I have described.

**A word processing program is invaluable if you do a lot of writing.** Not only does it make writing more enjoyable; it saves an enormous amount of time. Manuscript revision and alterations become a breeze. You only start printing out when your efforts look perfect on the screen. Once familiar with a word processing program (which takes a week or two) you will not willingly go back to an ordinary typewriter. Good word processing programs for inexpensive computers are available from $100.

Microcomputers can be used for programmed instruction, as Professor N. E. Carson pointed out at the recent RACGP conference. Courses could and should be developed for inexpensive microcomputers. An inexpensive disk unit with 1 or 2 megabytes of storage (or even less) would be quite adequate. But the programs themselves must be developed by medical practitioners who are also effective teachers. This is very time consuming and, if it has to make a profit, expensive.

When I lamented that there seemed to be so many accounting programs around, friends in the industry told me it was because most programmers had an accounting background. I therefore think it essential that doctors learn computer programming. BASIC programming is quite adequate for many medical purposes. **In 20 years time, when the present generation of "computer literate" children finish their medical course, our problems will ease.** At present there are too few doctors who know programming and have the time and the will to do it.

From the foregoing it can be seen that an outlay of between $15,000 and $30,000 is not necessary to get into medical computing. Furthermore, I have concluded after a decade of using microcomputers in general practice that whatever the price, the equipment will be quite out of date within three years. You should aim to write off your equipment in that period. (This is now allowed.) Moreover, three years from now computer equipment and applications will be so different that talk of 'updating' is rather meaningless.

A general practitioner thinking of using a computer in his practice should start small. Get a Commodore, Tandy, Apple, or similarly priced system. Use it for one or a few specific applications which suit your type of practice where you think it will speed up or simplify your work. If you don't get the desired result, you have not lost much. And whether the system works as expected or not, you will have learned to use a computer in your practice. This experience will be invaluable when you come to select your next and probably bigger system.

**As Professor Bridges-Webb put it so well at the 1981 RACGP computer conference: "You have to learn to walk before you try to run!"** ☐

**Maxwell W. Layard**
BEc(Stat)Syd, PhD(Math Stat)
Stanford

**Kirsten McKay**

# MEDLOG: a system for time-oriented clinical data

**In the past, physicians and medical researchers interested in computerising their clinical data had to turn to database management systems designed for large mainframe and mini-computers. The high operating and personnel costs associated with those systems have led to a search for a more cost-effective approach to computerised clinical data management. Today such an approach exists through the use of recently-developed microcomputer hardware, running software designed to eliminate the need for programming assistance. One group that developed this type of specialised software is Information Analysis Corporation (IAC), a software company in California. In 1983, IAC introduced MEDLOG, the first programming-free clinical data management system available for use on a microcomputer. MEDLOG is designed specifically for medical professionals interested in research and patient care applications. One of its particular strengths is its facility for handling medical data with important time dimensions, sometimes referred to as "time-oriented" data.**

## Managing time-oriented data

**Time relationships frequently play a central role in analysing and interpreting clinical data.** The temporal sequence of events and the time between events are critical, for example, in survival analysis. In evaluating prognosis or response to therapy, changes in the values of a clinical variable over time are often more significant than their magnitudes at particular points in time. **Because time information is so important, a competent clinical data management and analysis system should have good facilities for recording the values of repeatedly measured variables and their associated times of measurement.** It should also let you easily extract information on the basis of time relationships, and display and analyse this information in ways which take into account its time-oriented nature.

**Clinical studies present several problems for computerised data management and analysis.** These studies often involve hundreds of data items, irregular data collection times, and a great deal of unrecorded or missing data. Even carefully planned clinical trials usually involve uncontrollable or unpredictable events — adverse reactions, missed visits, losses to follow-up etc. **Getting information out of the computer files for statistical analysis can be a complex process, especially when time relationships are involved.** For example, if you want to analyse, for a group of cardiac surgery patients, blood pressure data six months after surgery, you have to ask the computer to identify the surgery dates and find the blood pressure measurements six months subsequent to those dates.

**Because of their general-purpose nature, most commercially available database management systems are not well-suited to storing and retrieving time-oriented clinical data.**

Typical problems include,

- *Inability to handle different numbers of visits per patient;*
- *Waste of storage space allocated to unrecorded data;*
- *Inability to retrieve data according to time-oriented criteria without programming;*
- *Slow data retrieval because the file structure is not designed for statistical analysis purposes. Though a general purpose database management system may perform well in commercial applications, clinical studies require a more specialised approach to avoid programming costs and delays in getting results.*

**MEDLOG is a special-purpose database management system, designed to efficiently handle time-oriented clinical data and to cut costs by making programming unnecessary.** It runs on low-cost microcomputers such as the IBM PC XT. Because of these features, MEDLOG provides medical personnel with computing facilities they can control and understand, and makes clinical data management and analysis much more convenient and affordable.

## MEDLOG's design and operation

**Like TOD, MEDLOG is designed to maximise the speed of data retrieval.** Even with large databases you can perform statistical analyses or generate reports while sitting at the computer. This objective is accomplished in two ways. First, through easy-to-use data selection facilities, you can specify the data to be analysed without having to write a program. Second, a data rearrangement technique, known as file transposing, allows the computer to very rapidly read the data needed for analysis from its mass storage medium (hard disc).

**The first step in setting up a MEDLOG database is to define the data dictionary** — that is, to tell MEDLOG what data items you want to record, and what their attributes are. **Four types of data can be recorded:** numeric, categorical (such as sex), date, and text (names and addresses, for example). Next, you select lists of variables to appear on data entry screens — these might correspond to data collection forms.

Having taken these steps to tailor the system to your needs, you are ready to enter data. As data are entered, MEDLOG checks the values against the variable descriptions in the data dictionary. Invalid entries are rejected with an appropriate error message. Changing data already entered is as simple as the original entry process. A utility program lets you automatically read data obtained from another computer system into MEDLOG files.

**It's possible to get up and running with MEDLOG quite quickly.** One user, an artificial heart valve manufacturer, had accumulated a considerable amount of data but, because of lack of suitable computing facilities, had not made use of it. Within two or three weeks of getting MEDLOG software, the staff had learned to use the system, had entered data, and were analysing them.

**MEDLOG stores an individual patient's data in a series of dated encounter (visit) records.** You can display these encounter records in a time-oriented flow-sheet format, with each column representing a dated encounter. MEDLOG will also produce a time-plot of one or more variables for an individual patient. These facilities are very useful when you are looking for trends or other changes over time.

A key element in the programming-free MEDLOG system is its facility for selecting patient encounter subsets on the basis of time and value relationships. For example, you can ask the system to identify patients who had two or more episodes of nausea within four weeks after initiation of a certain drug therapy. Another example of program-free sub-setting is identifying encounters where body weight decreased by 5% within two months — this involves searching within a time window as it ranges over each patient's entire observation period.

**MEDLOG's statistical analysis capabilities include descriptive statistics, t-tests, bargraphs, histograms, cross-tabulations, scatter plots, regression analysis and survival analysis.** All screen displays can be printed by pressing the print key on the computer keyboard. For advanced analyses, MEDLOG can format data sets for statistical packages like SAS and BMDP.

**The 10-million-character disc storage available on the IBM PC XT is adequate for a database with 2,000 patients having an average of 5 encounters each, and an average of 250 variables recorded per encounter.** Larger capacity discs, with 40-million-character storage or even more, are available and would accommodate much bigger databases.

## Applications of MEDLOG

**MEDLOG's features and flexibility make it an ideal data management and analysis tool for many medical applications, including databanks, clinical trials, occupational health monitoring and registries.**

**MEDLOG software is currently used for a variety of projects in the areas of orthopaedic surgery, cardiology, cardiac surgery, dermatology, oncology, rheumatology, immunology and neurology.** Users include medical schools, hospitals, group practices and commercial organisations. Some specific examples are described below.

## Clinical databanks

**A clinical databank can be defined as an accumulation of carefully defined data collected in a uniform manner in the course of patient treatment.** Databanks have been used for studies concerning the natural history of disease, prognosis, disease classification, diagnostic criteria, and cost-benefit analysis. Databanks also have a hypothesis generating function — experience with various therapies can suggest which therapies should be subjected to controlled randomised trials, and are likely to provide useful information for the design of the trials.

A prominent example of clinical databanks is the ARAMIS rheumatic disease project mentioned earlier. The ARAMIS network includes 17 centres across the United States and Canada. These centres use a common data dictionary of some 600 variables, with uniform definitions of demographic items, symptoms, signs, laboratory values, and therapies.

ARAMIS participating centres use the TOD database management system on Stanford University's IBM 3081 computer. A separate databank is maintained for each centre, but the investigators have access to the data from all centres, so they can compare analytical results between centres.

Because of the inconvenience and heavy cost of maintaining the ARAMIS databanks on a central mainframe computer, work is in progress to implement the transfer of the databanks to MEDLOG-equipped microcomputers. The Stanford databank, with data on some 3,000 patients having a total of 20,000 encounters, is currently being downloaded onto an IBM PC XT with an add-on 40-million-character disc drive. Another ARAMIS participant has been using MEDLOG for some time.

**In Australia, the Department of Rheumatology at Sydney's Royal North Shore Hospital is using MEDLOG to establish a rheumatic disease databank similar to the ARAMIS model.**

## Clinical trials

Another TOD user that is in the process of transferring its data management activities to MEDLOG is the Northern California Oncology Group (NCOG). NCOG conducts multi-centre cancer therapy trials. At present about 35 Phase I, II and III trials are ongoing in a variety of disease areas, with patient accrual ranging from less than 10 to over 200. Total enrolment in all active trials is about 1,800 patients. Planned duration of accrual ranges between six months and six years, and follow-up in some trials continues for several years after the end of accrual. The number of variables studied ranges from 60 to 150, and the number of encounters per patient averages fifteen.

In the clinical trials area, MEDLOG is also being used by the Southwest Oncology Group, a co-operative cancer study group centred in Texas, for data quality control work.

## Occupational health

**Occupational health monitoring, where large numbers of employees are being followed over long periods of time, is a natural application of MEDLOG.** MEDLOG's time-oriented retrieval and analysis facilities are ideal for addressing questions about the health and disease to time-dependent events such as changes in occupation and exposure to hazardous materials. **A large pharmaceutical company in California has begun to use MEDLOG for monitoring the health of employees in its chemical plants.**

A commercial health education and risk appraisal service, called Healthtrac, is offered to employers as a means of improving the health and productivity of their employees. The Healthtrac company uses MEDLOG to maintain employee records which can be used to evaluate changes over time. The resulting ability to keep subjects informed of their progress makes Healthtrac a better behaviour-modification tool than other similar services, which typically give advice based on data at a single time-point. The Healthtrac software is also sold to companies for use on their own MEDLOG-equipped computers.

## Future directions

**MEDLOG's developers believe that it can form the basis for a cost-effective automated medical record system for the physician's office.** In order to design such a system, a substantial amount of work is needed to modify the present system and integrate the clinical information component with administrative functions. However, the resulting product not only would provide an improved source of information for individual patient care, but would also provide easily used analysis capabilities that are not available in most computerised medical record systems. **These facilities could be used by research-minded physicians to perform, for their own patient populations, descriptive studies, quality of care reviews, outcome assessments, and prognosis studies.** □

**Ron Lord**
**Managing Director, R. J. Lord Pty. Ltd.**

# More on recall . . .

**Touting for business or sound preventive medicine? Can it be practised effectively in our fee for service and choice of doctor system or will it mean curbs on the choices of patients and doctors alike? And how far should a doctor intrude into a patient's privacy? These are some of the questions being asked in a slowly awakening debate about the use of the practice computer to recall patients for health screening and monitoring.**

For most doctors, the installation of their first computer is still a few years away. And it will probably be some years after that before they load the system with the medical records of all their patients.

**They will then be armed with a potent new tool for promoting preventive medicine:** the ability to instruct the computer to print out lists of patients (from age/sex registers) who are due for health screening (perhaps because they have moved into an at-risk age category) or monitoring (of anti-hypertensive therapy).

Apart from obtaining a first-time capability to articulate what primary medical care is doing and achieving in their practice (by being able to put their work into some kind of order, and describe and quantify it), general practitioners will be able to reach to new horizons in preventive medicine. **They will be able to recall patients for:**

- **Immunisation** (particularly against tetanus and influenza in adults and rubella and mumps in adolescents).
- **Education about lifestyle,** eating habits, physical exercise, drug prophylaxis, sexuality, and smoking and alcohol use.
- **Periodic health examinations in all age groups.**
- **Screening for hypertension, heart disease, diabetes, glaucoma, and breast, cervical and colonic carcinoma.**
- **Surveillance of people on long-term drug therapy** (such as oral contraception), **of people with physical problems such as hypertension, and those at social risk such as the elderly living alone.**

New Zealand general practitioner Dr. Stewart Reid told the RACGP's Fourth Computer Conference in Melbourne in May last year (1984) that the computer will transform general practitioners from being simply 'medical shopkeepers to the sick' and turn them into well-equipped practitioners who can aspire to be truly the people's health guardians.

**Dr. Reid reported how his practice has used the computer to improve quality of care by running a recall system for child immunisations. The practice has a 96% child immunisation rate.**

He said it is a major advantage to be able to check that all children who should be on recall are in fact on it. "The computer is quite happy to check the recall system against the patient register — a very difficult task to do manually," he said.

**Dr. Reid said their use in preventive medicine is the greatest contribution computers have brought to the practice.** Application of screening techniques now possible should enable decimation of the "law of halves" said to apply to hypertensives:

Half of those with blood pressure are not known.
Half of those known are not treated.
Half of those treated are not controlled.

Apart from screening and immunisation uses, **the computer produces a check list** when each elderly patient arrives for a normal visit: vision, teeth, blood pressure, mobility, hearing, feet, mental status, nutrition, continence, review of medication(s), etc.

**UK general practitioner Dr. David Rawlins said** universal registration of the population with general practitioners to give each doctor a defined patient population means **UK doctors are ideally placed to practise preventive medicine.**

This potential has not been realised for many reasons, not least of which is the boring, time-consuming repetitiveness of searching through 4,000 paper records to identify 'at risk' groups. Computers are changing all that, and only inertia and time will stop doctors entering appropriate patient details on computerised medical records.

**Dr. Rawlins' practice is building up its computer base to enable it to identify at-risk groups.** It wants, for example, to be able to write a personalised letter inviting all women in a particular age group to present for a cervical smear. **He lists the most valuable areas for preventive medicine as:**

- **Prevention of diphtheria, polio, tetanus, measles, whooping cough, rubella-affected infants, and tuberculosis.**
- **Prevention of cervical cancer.**
- **Prevention of stroke. Dr. Rawlins said 80% of strokes are attributed to hypertension.** Thus with successful detection and treatment of hypertensives, strokes in the community should be cut to less than a quarter of present rates.
- **Overall evaluation of medical care in the practice.** Dr. Rawlins is trying to evaluate how long his patients are living, and the quality of their lives (active and mobile? bed-bound.)

**The Shepherd Foundation,** Melbourne's multiphasic health testing centre, **is developing a computer program for Health Risk Appraisal originated by the Centre for Disease Control in the US Public Health Service.**

The program estimates the chances of an individual becoming ill or dying from selected causes. Certain events, attributes, and behaviours modify the chances and these can be written into the appraisal for an individual patient to calculate that person's risk against average risks in the population. **Its major advantage is said to be its potential for health education and encouraging changes of health behaviour.**

**The computer has the facility to provide information on the screen and as a print-out to reinforce information provided verbally by the doctor.**

**These applications of the practice computer are clear-cut. But there is less certainty about the ethics of their adoption and the ability of Australia's current health insurance system to cope.**

At the Melbourne RACGP conference, **Melbourne GP Dr. Alan Rose** grasped the nettle and **suggested that all Australians should be allocated to, and registered with, "participating general practices" to realise the full potential of computers for promoting health care.**

Dr. Rose, also a Senior Lecturer in the Department of Community Medicine at Monash University, proposed that the Government subsidise the development of computer facilities used to identify patients for recall to the doctor's surgery for immunisation, screening, and health education programs according to priorities based on public health needs.

He realised his proposal was "somewhat provocative", that it might prove unattainable in Australia, and that it raised concerns about unethical behaviour, overservicing, and 'touting for business'. He was **sensitive** to "the revolutionary nature of this proposal and the suspicion, opposition or even derision it may provoke".

But, said Dr. Rose, it could dramatically increase the level of preventive care undertaken in everyday general practice and achieve **a medical use of computers which benefited patients** in contrast with the practice management applications which helped doctors.

As an incentive, government sources could pay an annual capitation fee for every citizen whom a general practitioner registered. This would subsidise the cost of establishing and maintaining an age/sex register for the practice's patients. Once established under Australia's fee for service system, the national scheme would be self-funding.

Efforts to develop a national approach to preventive medicine in Australia have been handicapped by the patient's freedom to consult the doctor of their choice, said Dr. Rose. In the UK, where the scheme has been shown to be practicable, the NHS provides GPs with a defined list of patients, and all patients have a general practitioner. General practitioners can thus identify all their patients (active and inactive) at any one time.

Now, in Australia, a doctor can develop a comprehensive data base for each patient or prepare a simple register of all his patients defined by age, sex, occupation, or any other criteria of significance in defining and accessing at-risk groups.

Purely for the purposes of the preventive health scheme, the patients of non-participating doctors would be assigned to the registers of participating doctors. All patients, however, would be free at any time to seek other forms of health care from other doctors, or to change their place of registration.

**Perhaps of greatest interest in all of this will be the way the community reacts when it becomes aware of computer applications in this area.** While some doctors may be reluctant to install computers (let alone use them for recall), **the medical profession may well find itself compelled by consumer-led demand to respond with preventative health programs.**

As one general practitioner told the Melbourne conference, **the day will come when a medical practitioner will be held to be negligent for not having a computer, just as today he may be in legal jeopardy for not maintaining a patient record.**

The Royal Australian College of General Practitioners has requested Dr. Luke Middleton to develop a submission on the use of recall in preventive medicine. Dr. Middleton (Chairman of the Preventive and Community Medicine Committee of Council) states "In Australia, one of the problems is the definition of who is a practitioner's patient". Dr. Stewart Reid's definition at the RACGP's fourth computer conference is being considered. It is hoped that within six months the RACGP will have a definite policy on recall in preventive medicine.

Dieb Koury presents the following legal opinion on patient recall in the context of overservicing:

'Patient recall is an area of increasing controversy. As computers allow practitioners to list out 'at risk' categories of patients there is growing tendency for doctors to recall such category patients for testing.

The unanswered question is when does this practice constitute overservicing with all its legal ramifications. **It is impossible to give a definite answer.** It is not difficult to demonstrate where this practice would constitute over servicing. Such an example would be if a practitioner recalled all overweight males over the age of 40 to test for heart disease.

On the other hand, it is not difficult to find an example which would not constitute overservicing. If a practitioner recalled all patients who had had a cancer operation for periodic retesting, this would not constitute overservicing.

**The matter is complicated by emotional concerns.** Women who have had their first child are known to be more likely statistically to suffer certain types of cancer. Numerous articles have appeared in medical journals recommending Pap smears. This practice would probably not constitute overservicing.

If a practitioner tested a particular category of patient known to be 'at risk' as those patients come to his surgery on other matters, this would not constitute overservicing.

**Whether or not patient recall constitutes overservicing can only be determined by precedent. This is established by peer review through the decisions of Medical Services Committees of Inquiry.'** □

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# NEWS IN BRIEF...

## TRACKING ADDICTIVE DRUGS

**The computer is playing an important role in monitoring the movement of drugs of dependence in Australia and in signalling changes in consumption patterns which may mean improper use.**

Officers in the Commonwealth Department of Health believe the system, which is underpinned by computerised data processing, has reduced to a minimum the risk of legal drugs being diverted to the illicit market.

**Detection of a steep rise in the consumption of methadone tablets is a recent example of the system's effectiveness in pinpointing changes in patterns of consumption. Investigation sourced the high usage to unauthorised methadone maintenance programs, which were stopped.**

"There is no doubt that the system is effective in preventing the diversion of drugs from legal sources to the illegal trade," wrote Mr. D. W. Murdoch, Assistant Director-General, Drugs of Dependence Branch, on the United Nations' *Bulletin on Narcotics* (Vol. XXXV, No. 4). "Immediate attention is focused on events as they happen, and they can be speedily investigated."

**The Department was responsible for designing and implementing the system. It was introduced in January, 1970.** Prior to that, there was no effective check in the movement of legal drugs of dependence across State borders or within the States.

**Each year the Drugs of Dependence Monitoring System tracks about 300,000 movements of selected drugs from the moment of import or manufacture until they reach the final distributor** (in most cases a pharmacy, a veterinarian, or a hospital).

Responsibilities for drug control in Australia are divided between the Commonwealth and State or Territory governments. The Commonwealth, under its external powers, is responsible for control over the import and export of drugs, and the manufacture of narcotic drugs. The States are responsible for the control of drugs distributed within their boundaries.

The monitoring system has 147 reporting authorities, all of whom are companies licensed to import, export, manufacture, formulate or distribute as wholesalers. Reports generated involved purchases by some 6,000 pharmacies and 1,500 hospitals.

A total of 392,996 transactions of 35 monitored drugs were analysed in 1982. The system shows what quantity of the drug is imported, exported, locally produced, and used in manufacturing processes; the amount distributed, by whom, to whom, and in what form and quantity.

**Any new or unusual trend in the use of dependence-producing drugs is quickly detected.** Reports forwarded to the Department each week provide detailed information on imports and exports, loss, larceny, and controlled and accidental destruction.

**A profile can be created for a particular drug, geographical area, or recipient.** For example, if an unusually high usage of drugs is observed in a particular region, the State Health Department can request a report on all movements of drugs to that region. Any significant increase in the purchase of the drug is investigated. Reports can be provided on a particular pharmacy's trading which can be checked against entries in the drug register.

**An "exception report"** lists all hospitals and pharmacies whose purchases of a particular drug from all sources exceeds a preset level in any three-month period. The report highlights pharmacies in defined regions whose purchases of a drug seem to have been abnormally high for some time.

The system detects sales made to unlicensed buyers which can then be investigated.

## USER GROUPS

A medical computing users' group is being formed within the NSW Faculty of the Royal Australian College of General Practitioners along the lines of users' groups in Victoria and South Australia. Organiser is the Medical Practice Computer Subcommittee of the Faculty's Practice Management Committee.

**The group will benefit doctors who want to share knowledge and experience, learn from colleagues, and review new hardware and software.**

Those interested should write to **The Secretary, Medical Practice Computer Subcommittee, NSW**

**Faculty RACGP, 43 Lower Fort Street, Sydney, NSW and furnish the following:**

- Name, address, and practice telephone number.
- practice type.
- Whether a computer is used in the practice, and if so, the make and type of use.
- Degree of interest in attending quarterly meetings.

Those who write will receive an invitation to the first meeting of the Medical Computing Users' Group of NSW early in 1985.

## BACKGROUND OF MEDLOG'S DEVELOPMENT

Back in the late sixties and early seventies several medical researchers, notably Stanford University rheumatologist J. F. Fries, focused attention on the time dimension in clinical record-keeping. Fries' medical record system was based on the use of flow sheets which display the values of clinical variables for a number of sequential patient visits. Realising that these time-oriented medical records could be readily adapted to computerised management, Fries began developing a databank in 1968 for patients with rheumatic disease Other physicians in the USA and Canada were conducting similar projects, and these efforts led to the formation of the American Rheumatism Association Medical Information System (ARAMIS). Since 1975 ARAMIS has been a major program funded by the USA National Institutes of Health.

**A clinical database management system called TOD (Time Oriented Database) was developed at Stanford to manage the ARAMIS data.** TOD has also been used by other medical research projects, including the multi-centre clinical trials conducted by the Northern California Oncology Group. TOD runs on Stanford's IBM mainframe computer, and has proven to be a very successful system. However, escalating prices for computer time-sharing and the high cost of data communications from remote sites have made TOD increasingly uneconomical.

With the advent of powerful 16-bit microcomputers such as the IBM PC XT, MEDLOG's developers saw the possibility of designing a software system with TOD-like features that would run on an inexpensive desk-top computer. Though MEDLOG uses some of TOD's design concepts, it is a completely new system. It improves on TOD in several aspects, particularly in ease of use. MEDLOG is completely interactive — it gives you lists of options (menus) and prompts for responses, so you don't have to remember complicated commands.

## CORRESPONDENCE RE MUMPS

We refer to your article in the Spring issue of 'Practice Computing' in particular the article on MUMPS and would like to make the following comments:

When MUMPS was developed in 1966 the current languages offered, and in particular the implementations of BASIC, did not provide the facilities which prompted the development of this product. Since that time the explosion of development in the small systems area has prompted rapid and large scale change in the performance and efficiency of languages such as BASIC. These common languages being not specifically aimed at medical applications, have been used for the development of the majority of applications and have the benefit of guaranteed manufacturer and supplier support.

Clearly, the limitations of MUMPS to operate in conjunction with normal applications software and at times operating systems, severely restricts the effective use of the product. Vast improvements in the structure and performance of standard language implementations such as BASIC have removed the criticisms previously made of these products. It is essential for the systems application developer preparing systems in the commercial sphere to direct his efforts to products offered and supported by the systems supplier in order to guarantee continuation of support and enhancement for the software user.

Whilst it is desirable to adopt such standards as ANSI for their regulatory control of the industry, in practice these standards do not match the rate of development of products from the equipment manufacturer and limitations on the release of major product improvements results. The rate of software language implementation always falls behind that of the hardware industry.

In the interest of the consumer, it is essential that the systems developer not restrict the future of installed systems by the use of unique solutions such as MUMPS merely because such products have been developed under a specific industry environment, and offer no advantage over common products. Such development should utilise languages that maximise software availability and support.

Yours faithfully,

C. Ahyee
National Systems Manager

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**CONTRAINDICATIONS:**

**Bronchospasm::** Beta-adrenergic blockade of the smooth muscle of bronchi and bronchioles may result in an increased airways resistance. These drugs also reduce the effectiveness of asthma treatment. This may be dangerous in susceptible patients. Therefore beta-blockers are contraindicated in any patient with a history of airways obstruction or tendency to bronchospasm. Use of cardioselective beta-blockers can also result in severe bronchospasm. If such therapy must be used, great caution should be exercised. Alternative therapy should be considered. Congestive heart failure; right ventricular failure secondary to pulmonary hypertension; significant cardiomegaly; sinus bradycardia (one pharmacological action of TENORMIN is to reduce heart rate, a fall in standing heart rate below 45 to 50 beats per minute may indicate a need to reduce the dose or to withdraw the drug and to start again at a lower dose); A-V block grades II and III; cardiogenic shock; allergic rhinitis during the pollen season; anaesthesia with agents that produce myocardial depression (e.g. ether, chloroform and cyclopроprane); with verapamil (and neither drug should be administered within several days of discontinuing the other).
**Use in Pregnancy:** Safety in pregnancy has not been established, therefore it is not recommended for use in pregnant women or those likely to become pregnant unless the expected benefit outweighs the actual risk. In animal studies, there was no evidence of teratogenicity nor any adverse effects on fertility.. TENORMIN has been shown to produce a dose-related increase in embryo/foetal resorptions in rats at doses equal to or greater than 50mg/kg. Although similar effects were not seen in rabbits the compound was not evaluated in rabbits at doses above 25mg/kg.
**Use in Lactation:** TENORMIN is excreted in breast milk. It is therefore recommended that TENORMIN not be administered to nursing mothers unless alternative agents which are not excreted in breast milk are contraindicated. It should be noted that many other beta-blocking drugs are also excreted in breast milk.

**PRECAUTIONS:**

**Cardiac failure:** Beta-blockade depresses cardiac contractility and may precipitate cardiac failure in some patients following acute infarction, chronic myocardial insufficiency and chronic alcoholism (unsuspected cardiomyopathy). In patients without a history of cardiac failure, continuing depression of cardiac contractility may lead to cardiac failure.
**Abrupt withdrawal of therapy:** TENORMIN therapy should not be discontinued abruptly especially in patients with coexistent angina.
**Diabetes mellitus:** Caution should be observed when treating patients with unstable insulin dependant diabetes. For such patients however, if beta-blockade is considered necessary, it is preferable to use a Beta$_1$ selective blocking agent such as TENORMIN. Studies have show little or no prolongation of insulin induced hypoglycaemia compared to a prolongation of this effect with nonselective beta-blocking agents.
**Other metabolic effects:** In common with some other beta-blockers, TENORMIN has been shown to cause small increases in the plasma triglycerides in some patients. The long term clinical significance of this is unknown.
**Anaesthesia:** The management of patients being treated with beta-blockers and undergoing elective or emergency surgery is controversial. For full information refer to MIMS ANNUAL.
**Clonidine:** If TENORMIN and clonidine are given concurrently the clonidine should not be discontinued until several days after the withdrawal of the beta-blocker.
**Renal failure:** Since TENORMIN is excreted via the kidneys, dosage should be adjusted with special care in patients with severe impairment of renal function.

**ADVERSE REACTIONS:**

Adverse reactions reported in clinical trials of TENORMIN are mainly attributable to pharmacological actions. These include coldness of the extremities, muscular fatigue and isolated instances of bradycardia. Reports of sleep disturbances, of the types associated with other beta-blockers, are rare. In addition gastrointestinal effects such as indigestion, constipation and diarrhoea have been reported. Dizziness, not necessitating withdrawal, has also been reported. Various skin rashes and conjunctival xerosis have been reported with beta-blocking agents including TENORMIN. Such reactions may occur between beta-blockers and susbstitution within the group may not necessarily preclude recurrence of symptoms. During long term treatment with the beta-blocking drug practolol, a specific rash bearing a superficial resemblance to psoriasis was occasionally described. In a number of patients affected, this rash was accompanied by adverse effects on the eye (xerophthalmia and/or keratoconjunctivitis) of varying severity. In a few patients these eye changes occurred independently of a skin rash. On rare occasions serous otitis media, sclerosing peritonitis, pericarditis and pleurisy have been reported. Although these adverse reactions have not been observed in patients receiving other beta-blocking drugs, including TENORMIN, the possibility of such side effects occuring should be borne in mind.

**INTERACTIONS:**

Verapamil, see Contraindications. Care should be taken in prescribing a beta-adrenoceptor blocking drug with Class I antidysrhythmic agents such as disopyramide.

**OVERDOSAGE:**

Overdosage has not been reported with TENORMIN but in overdosage with other beta-blocking agents severe bradycardia and hypotension are commonly found. Acute heart failure and bronchospasm may also occur.
**Treatment:** Excessive bradycardia may be countered with atropine, 1 to 2 mg intravenously. This can be followed if appropriate, by a stimulant such as isoprenaline (25 microgram initially) or orciprenaline 500 microgram, given as a slow intravenous injection. Care must be taken to ensure that the blood pressure does not fall too low if the dose of the beta-receptor agonist has to be increased.

**DOSAGE AND ADMINISTRATION:**

**Hypertension:** Therapy should be initiated with 50mg of TENORMIN daily (most patients respond to 50mg daily). This may be increased each week in daily doses of 50mg up to a maximum of 200mg. Where patients are controlled on daily doses of 50-100mg this may be given once daily. Doses above 100mg daily should be given on a divided basis. Where necessary, a further reduction in blood pressure may be achieved by combining TENORMIN with other antihypertensive agents.
Patients can be transferred to TENORMIN from other antihypertensive treatments with the exception of clonidine (see precautions above).
**Angina Pectoris:** Therapy should be initiated with 50mg of TENORMIN daily. This may be increased, if required, to 100mg daily given as a single or divided dose. It is unlikely that additional benefit will be gained by increasing dose.

**STORAGE:**

Protect from heat, light and moisture.

**PACK:**

TENORMIN is presented as white, round, scored, biconvex tablets marked TENORMIN 50 on one side, each tablet containing 50mg atenolol in calendar packs of 30 tablets.
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## ENTHUSIASTIC RESPONSE TO FIRST ISSUE

Response from potential contributors to the first issue of *Practice Computing* demonstrates the quality and diversity of work being done in Australia on the medical applications of the computer.

The Editorial Panel is now reviewing offers from user-readers to contribute articles on a wide range of applications. They include use of the home computer to access computerised databases of the medical literature, a consultant's experience in troubleshooting the pitfalls of computer installations, occupational health issues in the operation of visual display terminals (VDT's), computer applications in the teaching of community medicine, and self audit and research in general practice.

These articles are additional to those already commissioned by *Practice Computing* which will appear in future issues. ☐

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**This article was supplied on request by the Commonwealth Department of Health.**

# The Fraud and Overservicing Detection System — a computing application

**The Fraud and Overservicing Detection System (FODS) is a computer-based statistical system employed by the Commonwealth Department of Health as an aid to the detection of possible fraud and overservicing in relation to services attracting Medicare benefits.**

## Data

**The data used in this system consist of details of services which attract Medicare benefits — that is, most medical services provided on a fee-for-service basis, most optometrical consultations, and a limited range of services provided by oral surgeons and orthodontists.**

**The system has been progressively introduced since April 1981,** and operates in essentially the same way with Medicare data as it did with data provided by the private health insurance funds prior to Medicare. However, under Medicare, the data are available in a more timely fashion and more accurately than was possible under previous schemes.

Claim details are received daily from the Health Insurance Commission on magnetic tape and entered into the Department's computer system. About 110 million services per year are processed and the details of each service held in a 206 byte record. **The initial source of the data is the claim for benefits — made either by a practitioner who direct-bills, or by or on behalf of the patient, before or after payment has been made to the practitioner.**

The data items collected include date of service; provider number; patient's date of birth and sex; item number; fee charged; schedule fee; benefit paid; and other processing details and information relating to multiple operations/anaesthetics, and pathology if applicable.

## Files and software

**The files which are interrogated by FODS programs are arranged in a 3-tiered hierarchy, and are currently held on magnetic tape.** These are (1) an archive file; (2) a provider summary file; and (3) a monitoring summary file.

**The archive file** contains all claim details from November 1978 to the present — over 100 gigabytes of data. The archive is sorted on various keys including provider number, health insurance fund, and date of service.

**The provider summary file** summarises and tabulates services rendered by each practitioner within a 3-month period, and is used to produce scan profile reports.

**The least detailed level of data is held on the monitoring summary file.** This holds totalled and computed information extracted from the provider summary file, and is used to produce a range of monitoring reports every quarter.

**An additional file contains all information recorded about pathology referrals and services.**

The software used to extract information from these files consists of an extensive set of COBOL programs, and a few older programs written in the IBM assembly code Assembler. The programs are organised into 6 sub-systems and executed either on request by officers responsible for analysing and reviewing the data (for example to produce analysis profiles) or quarterly for most other profiles.

**A growing number of programs used to interrogate the FODS files is being designed and written by users of the information rather than specialist programmers, in user access languages such as FOCUS.**

## Reports

**The users of FODS are primarily monitoring officers and medical counsellors.** Monitoring officers apply statistical techniques to information on profiles in order to determine whether a practice requires further analysis.

**The medical counsellors provide professional knowledge in the interpretation of profile information. They also visit practitioners to advise them in the operation of the medical benefits scheme or to discuss with them apparently unusual practice patterns and where necessary to counsel them on these patterns. Counsellors may also visit medical practitioners to provide information on the legislative and administrative framework that applies to medical practice in Australia.**

Where possible fraud or overservicing is indicated, some reports are also used by departmental investigators and committees of inquiry respectively.

**The reports, like the files from which they are extracted, are produced at three levels of details:**

1. ***Monitoring reports*** **from the monitoring summary file enable high level reviews of all specialties, regions, states and some individual practitioners, to determine where deviations from peer group norms are highest.** Deviation from a statistical norm is, of course, not evidence of abuse, but merely one indication of the need for further analysis. However, experience has shown that it is appropriate for practitioners who have, for example, a substantially higher cost per patient than their peers to receive priority in the analysis of their practices. Monitoring reports are used to set priorities for analysis.

2. ***Scan profile reports*** **— a single page report is produced each quarter for each active practitioner.** It tabulates his most frequently provided services in order of incidence, and provides a histogram representation of the proportion of patients seen once, twice etc., up to 24 or more times per quarter. Printed alongside the statistics for the individual practitioner are comparable statistics for the peer group norm, so highlighting particular deviations which could indicate a need for further examination. Conversely, it enables the monitor or counsellor to identify factors in a practice which explain deviations from the norm, for example, a high older population, or the fact that a practitioner provides rather than refers radiology services.

3. ***Analysis and specialty profiles*** **— where analysis of the scan profile indicates areas of possible abuse, FODS provides the facility to print detailed claims information from the archive file.** Analysis profiles print this information either in list or calendar matrix format. For example, one type of analysis profile displays a calendar showing for a particular patient the item number of each service rendered by day of the week, month and year.

The production of these profiles is a sophisticated process which enables the monitoring officer to use a wide range of selection criteria and print options to isolate various aspects of a doctor's practice, with the objective of supporting or refuting a hypothesis (at a statistical level) about the practice. Discussion of the results of the statistical analysis by the monitoring officer and a medical counsellor provides professional medical input into the analysis process.

At a similar level of detail, **a range of specific profiles has been developed to highlight aberrations in the requesting and rendering of diagnostic services.** These were developed to investigate possible abuse in the pathology field, but they have also been used on data concerning radiology services.

There is no on-line facility for the interrogation of archival data by monitoring officers. Requests for detailed statistics are sent from the State offices to Canberra and batch processed. **All requests for data are examined and must be authorised before processing. Appropriate security measures are in place to protect the privacy of information about individuals and to satisfy the secrecy provisions of the Health Insurance Act, which makes the unauthorised disclosure of personal information an offence.**

## The computer — technical details

The Department's central computer configuration consists of two IBM 3083J computers each with 16 million bytes of main memory and 16 channels. Each channel is capable of transferring data at 3 million bytes per second between the central computers and peripheral devices such as magnetic tape drives, the laser printer and the disk storage devices.

The two computers are linked together and all the peripheral equipments are available to either of the two computer systems. Although the two systems are

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**2. Medical Computer Business Directory 1984**
A comprehensive directory of the suppliers of software and hardware for medical applications. This handbook gives you the information you need about each supplier on the Australian market – brought up to date this year.

**3. Handbook on Computers in General Practice**
This 60 page handbook covers the applications you need to know; accounting systems, medical records, hardware, space, contracts and installation. A thorough analysis of the benefits and problems of computers in general practice.

**4. Minimum Standards for Computerised Medical Records**
This book provides detailed specifications of the minimum requirements a system must fulfil if it is to perform in a clinical application. It will enable you to specify what you will need for your particular practice.

The publications are available from the:
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controlled from a single control console the two computers operate independently with one being dedicated to support production application systems and the other being used for interactive terminal support and program development. The computer centre is operated for two shifts each day from Monday to Friday and operates in unattended mode overnight and at weekends to provide on-line access to Health Information Services (MEDLARS, NDIS, etc.) and to support other on-line terminal activities for authorised users. Approximately 8000 jobs are processed each week, involving over 0.5 million pages of print-out per week and the production of over 0.25 million frames of microfiche production.

The disc storage sub-system consists of 24 disc drive modules each having a capacity of 2520 million bytes of information. Additionally the configuration includes high speed paging devices that consist of two solid state discs and four fixed head drums. These devices are used to provide temporary storage for sections of programs and data that are temporarily transferred from main memory so that the space released can be used by other programs executing simultaneously. The paging devices provide almost immediate access to the data held and can sustain an extremely high rate of service to the central computers.

The magnetic tape system comprises 18 magnetic tape drives which are capable of reading and writing information to tape at densities of 1600 or 6250 characters per inch and two drives able to read and write data recorded at lower density. A standard tape used on these drives contains 2400 feet of tape and the Departmental Tape Library contains approximately 18,000 magnetic tapes. The printing sub-system consists of a laser printer capable of printing out information at 20,000 lines per minute, and an impact printer which is capable of printing at 2,000 lines per minute.

The central computer configuration is connected via a communications controller to Telecom's DATEL and Digital Data Services to provide data communications links to all State capitals, and to AUSTPAC to provide dial-up access and on-line connection for a nationwide terminal network. A total of 13 IBM Series/1 minicomputers and 363 VDUs are located in state capitals to provide a data entry facility for the pharmaceutical benefits payment system (Pharmpay). In the event of a communications link failure, data can be temporarily stored on disc on the minicomputer for later transmission.

The communications network also provides interactive terminal access for over 200 organisations to a Medical Literature Analysis and Retrieval System (MEDLARS). Citations and indexing information for over 3,000 journals, and a smaller number of monographs, are stored in the MEDLARS data bases which now contain 3.5 million references to medical articles published during the past 16 years. The 200 organisations using the MEDLARS Service use over 12,200 terminal connect hours and obtain printout of more than 3.2 million citations per year from the MEDLARS data base files.

Additionally the communications network provides access to the National Drug Information Service (NDIS). This information service which is progressively being extended to include additional therapeutic drug profiles, currently contains 257 comprehensive drug profiles. Information about new preparations on the market is continuously evaluated and passed on to hospitals, doctors pharmacists and other authorised users. The computers are used to keep the information up to date and to provide on-line access via display terminals in 10 major centres located mostly in hospitals around the country. Ultimately, when most doctors and chemists have their own communicating personal computers, nationwide access to both the MEDLARS and the National Drug Information Service will be provided routinely from the central computer system of the Department of Health.

**A major function performed by the central computer system is to provide support for the Commonwealth Government's programs requiring the processing and correlation of vast quantities of data. The computers are used to process claims for payment under the Nursing Home Benefits and Assistance Schemes involving total expenditure estimated at $1,000 million for 1984-85. In support of the Pharmaceutical Benefits Scheme, claims for payment to pharmacists in respect of around 140 million prescriptions are processed each year, including those for the Department of Veterans' Affairs Repatriation Pharmaceutical Benefits Payment System involving total payments estimated at $640 million for 1984-85. Claims from private hospitals for Commonwealth bed-day subsidies estimated at $140 million for 1984-85 are also processed. In addition to the MEDLARS and the National Drug Information Services the Department of Health also provides computing resources for systems monitoring the licit supply of drugs of dependence, reporting from hospitals and doctors on adverse drug reaction, as well as meeting many smaller requirements for computer processing.** ☐

## Ann Nolan

**Seven years experience with the computer in the private health insurance industry.**

# FODS — the 'computer snoop'

The Department of Health has a Fraud and Overservicing Detection System (FODS) for the purpose of identifying possible overserving and/or fraud. The computer system has something like eighty-one different types of reports. Twenty seven of these reports are used directly to monitor doctors' activities. The others can be used to supplement these reports. In this issue the article reports on the key report — the doctors scan profile. The Fraud and Overservicing Detection System was conceived by John Kelly, former Director of Fraud and Overservicing and now a Health Economist with the Department of Health. He graduated from the Australian National University with majors in Physics, Applied Mathematics, Economic and Political Science. He has had fourteen years experience with health insurance schemes, and has studied overseas' health arrangements. His system was the forerunner to the surveillance and investigation system.

### What's to come

**Over the next three years every practitioner in Australia will be visited by a medical counsellor from the Department of Health.** The key talking point in each of these interviews will be the doctor's own practitioners personal scan profile report. This one page document is a complex one, summarising your practice.

**There are 34 specialists recognised, including the GP. Within these 34 categories there are 110 sub-groups of which the largest is the specialist physician with 22 classifications. The interpretations of these scans is complex and the Department of Health has created a completely new branch to police this area.**

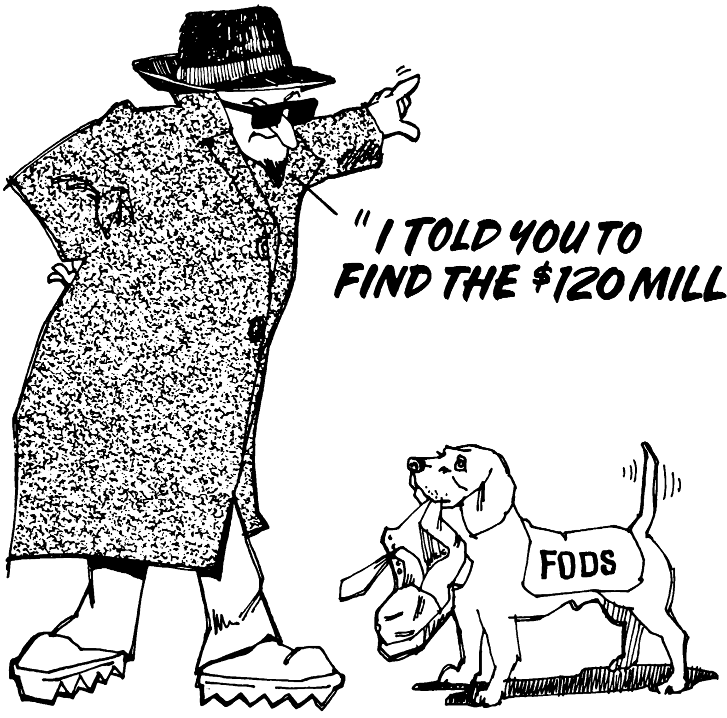
### Scan profile report

The initial screening device used by the Department of Health in their assault on the overservicing and/or frauding doctor is the individual doctor's Scan Profile Report. The Department's computer produces a scan for each doctor who claims medical benefits. If there are no claims the computer ignores you. **The scan is a one page summary of all claims for taxpayers funds which have been received during a quarterly period.** It provides information to the Department on the type and size of a doctor's practice without listing any specific details about individual patients.

When a doctor departs from the average, the Department will start searching for a cause. In their search for a reason, the doctors and patients may be interviewed.

### How to read your scan

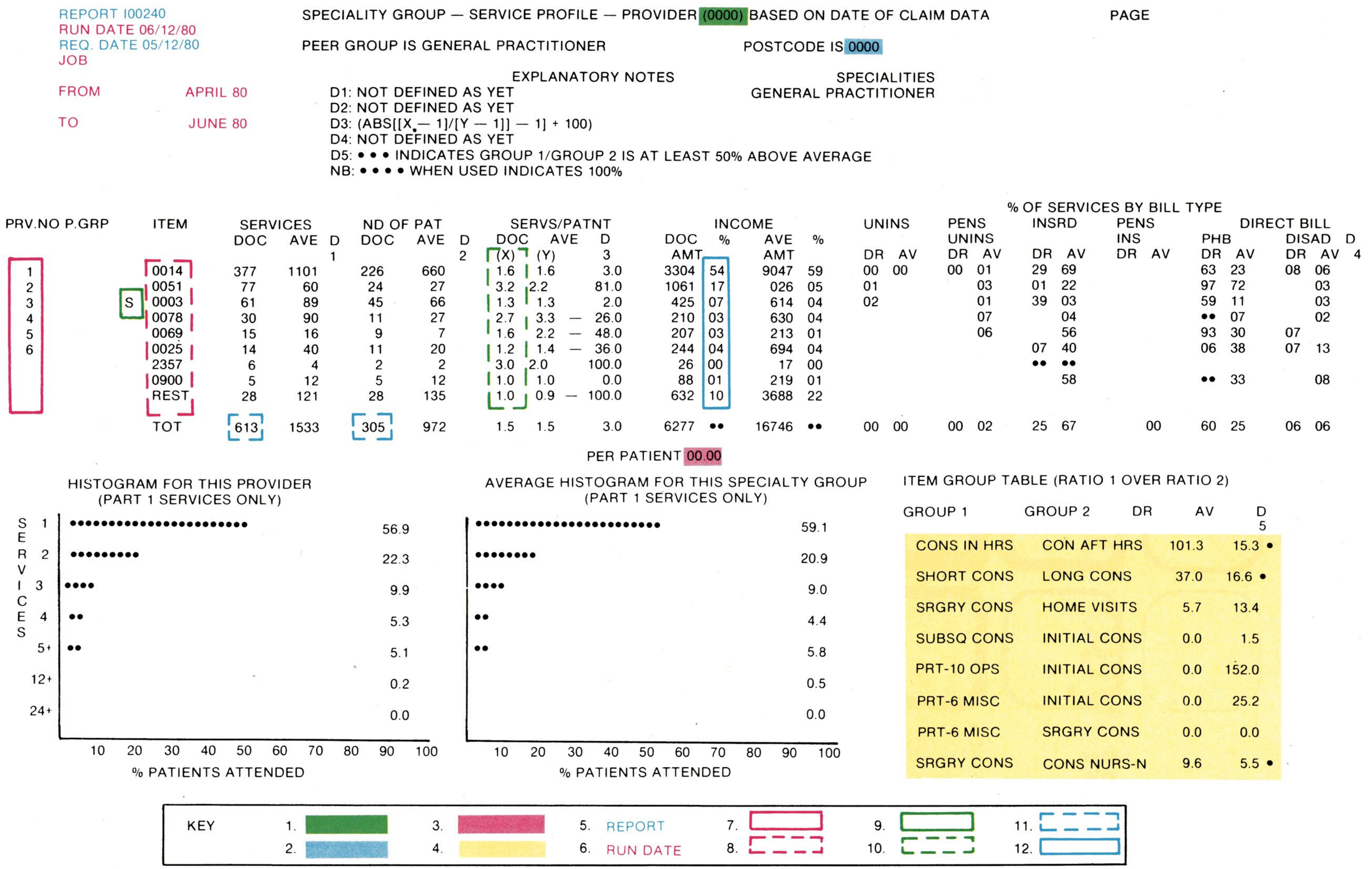
**The average doctor when faced with his or her personal profile for the first time finds it a jumble of numbers. The accompanying table provides the basic knowledge for understanding the scan profile discussed between the doctor and the counsellor. It must be remembered that the scan profile supplied by the Health Department, on the independent request of a doctor, is an abridged version of the one illustrated.**


"I TOLD YOU TO FIND THE $120 MILLION!"
FODS

**The Practitioner's Personal Scan Profile Report show everything a doctor needs to know about his personal scan.**

1. This is the provider number. Always check that this is the correct number. There are many numbers in the system and it is easy to make a mistake.
2. This is the postcode. This is generally how a group of profile scans are extracted from the computer. It should be the doctor's place of employment.
3. The average scheduled fee cost per patient. Usually this is the initial point of the profile scan.
4. This series of ratios is a comparison of your practice with your peers.
5. The run and requested date should be the same. If different, always ask why.
6. These two dates indicate the length of the review. The relativity of these two dates is important. Much can be assessed from the time difference between these two groups.
7. This is the doctor's different provider numbers. The more provider numbers a doctor has, the greater the doubt in arriving at a conclusion. The new proposed single provider number legislation will make it easier for the Department of Health.
8. The item number list is the main table of the provider scan. Up to thirteen items can be listed. With data collected since Medibank Mark 1, this list can be compared with acceptable combinations and norms. If this combination is unacceptable, attention will be drawn to your profile scan.
9. The pay group link allows horizontal exploration of the doctor's associates. A doctor should ensure that he is linked to practitioners who are completely clean.
10. The doctor's ratio of patients to services is checked and although cost per patient is acceptable, scrutinising of a practice will occur if there is any variance.
11. These totals give an insight into the practice, however they are not vital on their own. The number of services should always tally. The number of services will generally never tally if there is some double counting in this column.
12. This column tells what items are the best income producers. There are acceptable standards outside of which investigations will occur.

## SCAN PROFILE REPORT



```
REPORT I00240            SPECIALITY GROUP — SERVICE PROFILE — PROVIDER (0000) BASED ON DATE OF CLAIM DATA           PAGE
RUN DATE 06/12/80
REQ. DATE 05/12/80       PEER GROUP IS GENERAL PRACTITIONER                     POSTCODE IS 0000
JOB
                                              EXPLANATORY NOTES                                  SPECIALITIES
FROM          APRIL 80     D1: NOT DEFINED AS YET                                          GENERAL PRACTITIONER
                           D2: NOT DEFINED AS YET
TO            JUNE 80      D3: (ABS[[X — 1]/[Y — 1]] — 1] + 100)
                           D4: NOT DEFINED AS YET
                           D5: • • • INDICATES GROUP 1/GROUP 2 IS AT LEAST 50% ABOVE AVERAGE
                           NB: • • • • WHEN USED INDICATES 100%

                                                                                                               % OF SERVICES BY BILL TYPE
PRV.NO P.GRP   ITEM     SERVICES        ND OF PAT      SERVS/PATNT               INCOME              UNINS    PENS     INSRD    PENS         DIRECT BILL
                        DOC   AVE  D    DOC   AVE  D   DOC   AVE     D       DOC   %    AVE   %             UNINS             INS     PHB      DISAD   D
                                   1                2  (X)   (Y)     3       AMT        AMT          DR AV    DR AV    DR AV    DR AV   DR AV    DR AV   4
  1            0014     377   1101      226   660      1.6   1.6       3.0   3304  54   9047  59   00 00    00 01    29 69            63 23    08 06
  2            0051      77     60       24    27      3.2   2.2      81.0   1061  17    026  05   01          03    01 22            97 72       03
  3          S 0003      61     89       45    66      1.3   1.3       2.0    425  07    614  04   02          01    39 03            59 11       03
  4            0078      30     90       11    27      2.7   3.3  —   26.0    210  03    630  04               07       04            •• 07       02
  5            0069      15     16        9     7      1.6   2.2  —   48.0    207  03    213  01               06       56            93 30    07
  6            0025      14     40       11    20      1.2   1.4  —   36.0    244  04    694  04                     07 40            06 38    07 13
               2357       6      4        2     2      3.0   2.0     100.0     26  00     17  00                     •• ••
               0900       5     12        5    12      1.0   1.0       0.0     88  01    219  01                        58            •• 33       08
               REST      28    121       28   135      1.0   0.9  —  100.0    632  10   3688  22

               TOT      613   1533      305   972      1.5   1.5       3.0   6277  ••  16746  ••   00 00    00 02    25 67       00   60 25    06 06

                                                                   PER PATIENT 00.00

        HISTOGRAM FOR THIS PROVIDER                 AVERAGE HISTOGRAM FOR THIS SPECIALTY GROUP      ITEM GROUP TABLE (RATIO 1 OVER RATIO 2)
          (PART 1 SERVICES ONLY)                             (PART 1 SERVICES ONLY)
                                                                                                    GROUP 1       GROUP 2        DR      AV     D
S  1 |••••••••••••••••••••••••       56.9   |•••••••••••••••••••••••••       59.1                                                               5
E    |                                      |                                                       CONS IN HRS   CON AFT HRS   101.3   15.3 •
R  2 |•••••••••                      22.3   |••••••••                        20.9                   SHORT CONS    LONG CONS      37.0   16.6 •
V    |                                      |                                                       SRGRY CONS    HOME VISITS     5.7   13.4
I  3 |••••                            9.9   |••••                             9.0                   SUBSQ CONS    INITIAL CONS    0.0    1.5
C    |                                      |                                                       PRT-10 OPS    INITIAL CONS    0.0  152.0
E  4 |••                              5.3   |••                               4.4                   PRT-6 MISC    INITIAL CONS    0.0   25.2
S    |                                      |                                                       PRT-6 MISC    SRGRY CONS      0.0    0.0
  5+ |••                              5.1   |••                               5.8                   SRGRY CONS    CONS NURS-N     9.6    5.5 •
     |                                      |
 12+ |                                0.2   |                                 0.5
     |                                      |
 24+ |                                0.0   |                                 0.0
     |______________________________________|________________________________________
       10  20  30  40  50  60  70  80  90  100    10  20  30  40  50  60  70  80  90  100
             % PATIENTS ATTENDED                         % PATIENTS ATTENDED
```

| KEY | | | | | | |
|---|---|---|---|---|---|---|
| | 1. 🟩 | 3. 🟥 | 5. REPORT | 7. ▭ | 9. ▭ | 11. ⬚ |
| | 2. 🟦 | 4. 🟨 | 6. RUN DATE | 8. ⬚ | 10. ⬚ | 12. ▭ |

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Preferred contact: Work ☐ Home ☐

I hope to make a decision
☐ Urgent
☐ Within 6 months
☐ 6-12 months
☐ Don't know

I would like to speak with:
☐ Same specialty........................
☐ Close location
☐ Group.......................number
☐ Solo

Most important Information required

..........................................................................................

Hospital Computers Pty. Ltd. 86 Kareena Rd. Miranda 2228 Phone (02) 526 9101

## LET'S TALK ABOUT...

**Ian Douglas Bieske**
BCom, AASA, CPA
**Director I and S Financial Services Pty Ltd**

# 'You get what you pay for'

**Computers are now a reality for many medical practices. But only a small percentage in Australia have them.** Over the next five years, this percentage is likely to increase dramatically.

In considering a computer purchase, beware: "You get what you pay for!" **There are more than 30 medical computer systems in the market place,** ranging in price from $10,000 to more than $50,000. The price of the system you select will depend on the functions the computer is to be used for (both now and in the future), the size of the practice and the number of practice locations. **To illustrate this, let us look at two extreme cases:**

1. The one-man practice that, having decided to computerise patient billing/receipting decides to purchase a system designed for that task. The computer would probably be a micro or personal computer costing about $12,000 to $16,000 installed in the practice. (By installed I mean the computer itself, the software (programs) and a training program to educate the practice staff in its use.)
2. A large group practice with several locations decides to fully computerise patient billing/receipting, practice accounting (at the request of the practice manager), patient histories and some word processing. This practice would be wasting its time looking at small personal computers. The practice needs a larger capacity system or microcomputer to meet requirements such as a terminal in each room and probably another two or three terminals for the general office. This system is likely to cost more than $40,000 installed.

Whatever the requirements of your practice, the important point to remember is that you can expect a system to perform only to its capability. **You need to ensure that your expectations match the capability of the system you purchase. Remember, 'You get what you pay for!'**

If you have spoken to computer salesmen, you will be aware that it is extremely difficult to ascertain total costs. **You should be satisfied that you understand both the hidden and apparent costs of your chosen system.** □

**In the next issue,** *PRACTICE COMPUTING will investigate the costs of buying and owning a computer in more detail. PRACTICE COMPUTING will also outline the finance/tax alternatives of your computer purchase.*

## ADVICE TO CONTRIBUTORS:

Practice Computing is a computer journal for medical practitioners. The journal is directed to the novice as well as the experienced computer user. One of our major aims is to share our experience. The Editorial policy is to present an unbiased review of the new technology as it applies to the art of the practice of medicine.

Practice Computing invites you to submit up to 600 words on any aspect of medical computing. The decision to publish rests with the Managing Editor. Longer articles up to 3000 words may be accepted. However, all articles are subject to editing. Publication implies acceptance of all the standard restrictions of copyright. Letters to the Editor will be welcomed.

**Typescript:** Please submit 2 copies. Type on one side of A4 paper, in double spacing with a margin of not less than 3 cm. The Author should retain his own copy. Diagrams and graphs must be of high standard to complement the article and photographs must be of good definition to allow reproduction. Coloured photographs should be supplied as a transparency.

**Author Identification:** Please supply: Full Name and Address, Telephone Number, Qualifications, Principal Academic Title and Professional Affiliations.

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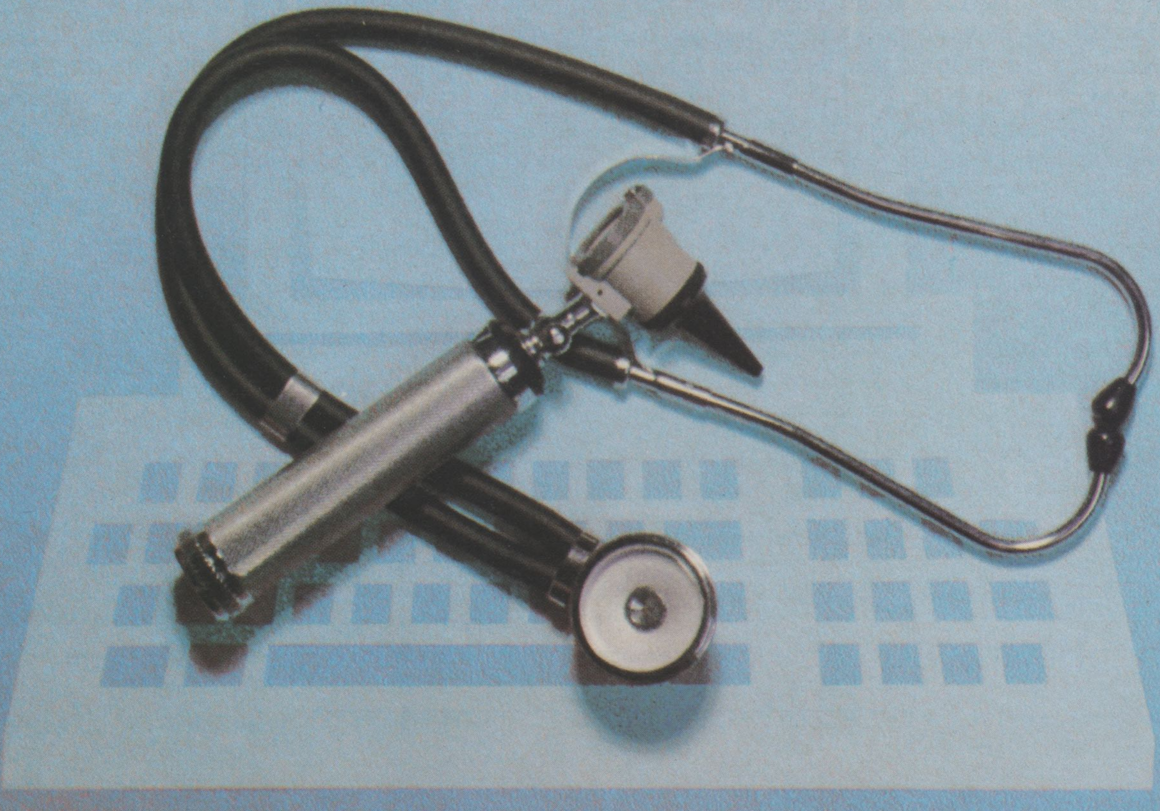

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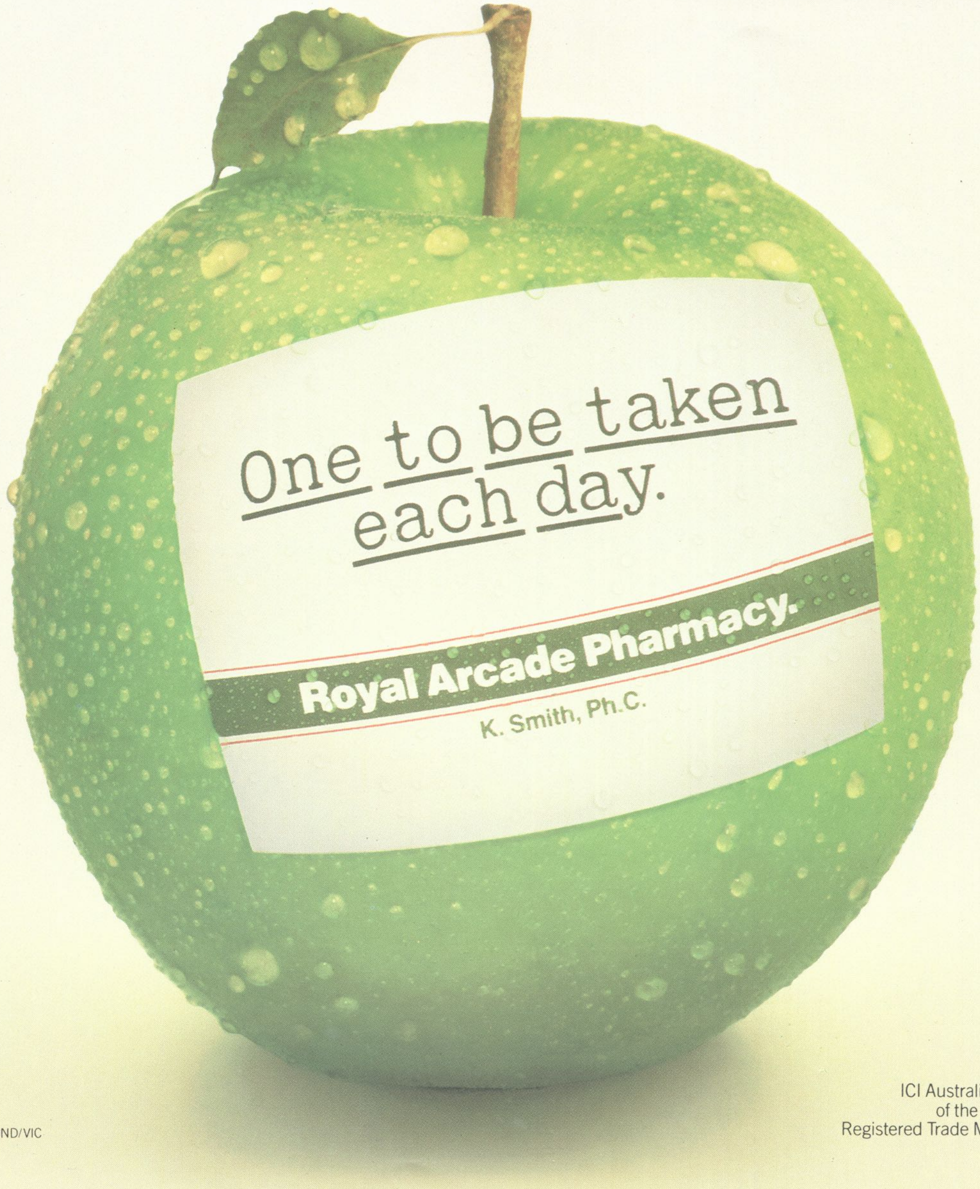

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[1] Herman, R.L. *et al* Postmarketing evaluation of atenolol (Tenormin®): a new cardioselective beta-blocker, *Current Therapeutics Research* 1983; *33:* 165-171.

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